FIG.1

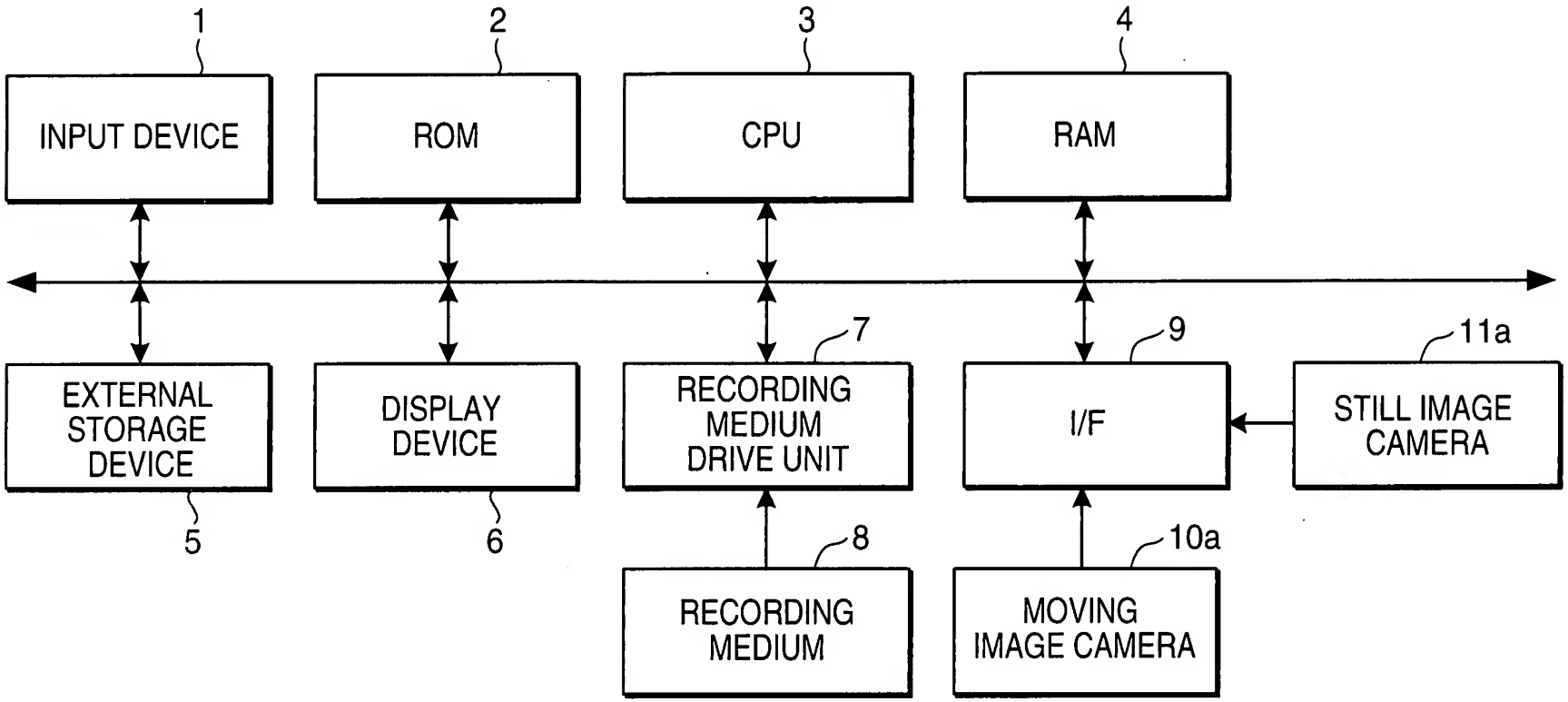

1
2
3
4
INPUT DEVICE
ROM
CPU
RAM
7
9
11a
EXTERNAL STORAGE DEVICE
DISPLAY DEVICE
RECORDING MEDIUM DRIVE UNIT
I/F
STILL IMAGE CAMERA
5
6
8
10a
RECORDING MEDIUM
MOVING IMAGE CAMERA

FIG.2

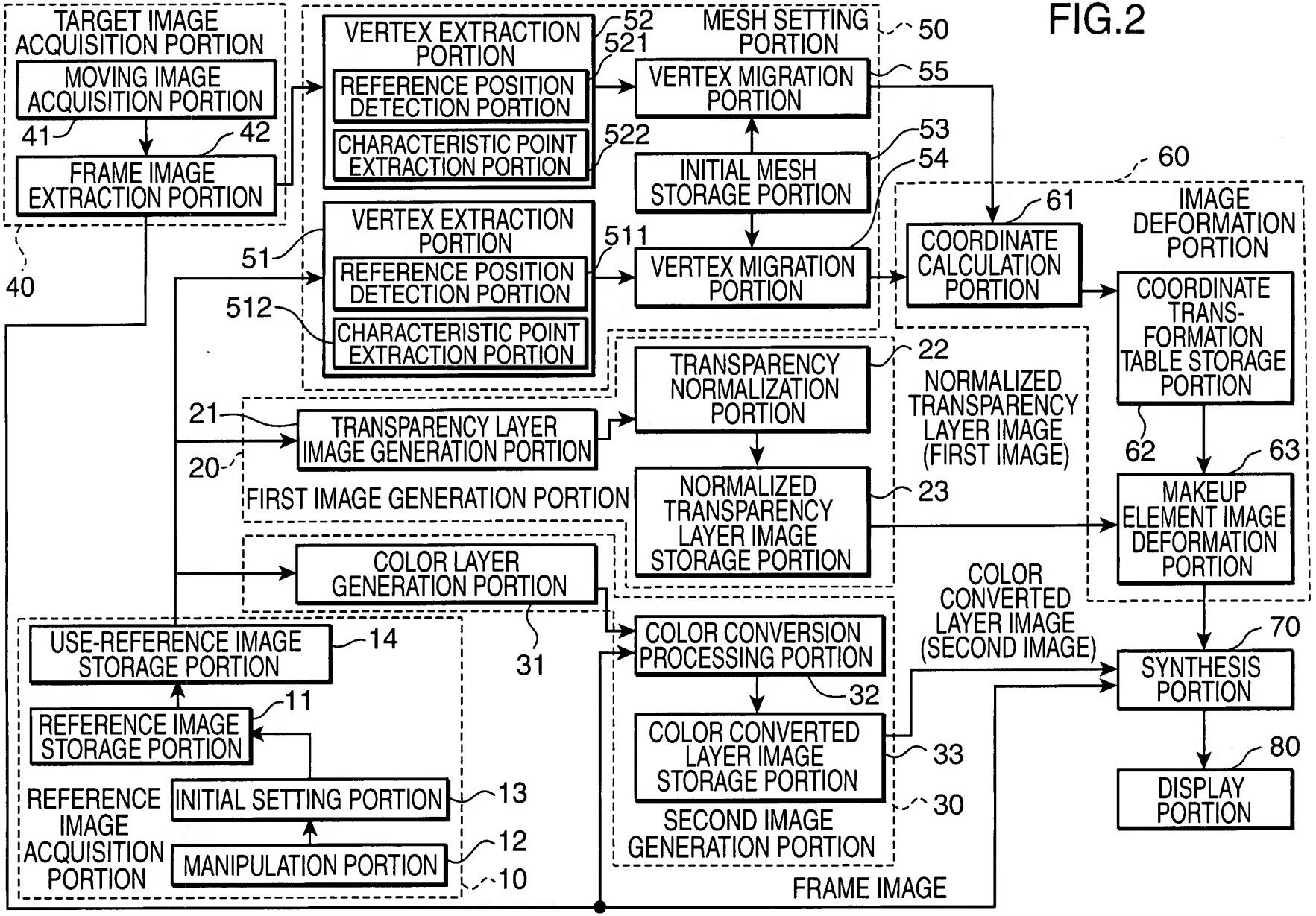

TARGET IMAGE ACQUISITION PORTION
MOVING IMAGE ACQUISITION PORTION
41
42
FRAME IMAGE EXTRACTION PORTION
40
VERTEX EXTRACTION PORTION
52
521
REFERENCE POSITION DETECTION PORTION
CHARACTERISTIC POINT EXTRACTION PORTION
522
MESH SETTING PORTION
50
VERTEX MIGRATION PORTION
55
53
INITIAL MESH STORAGE PORTION
54
VERTEX EXTRACTION PORTION
51
511
REFERENCE POSITION DETECTION PORTION
512
CHARACTERISTIC POINT EXTRACTION PORTION
VERTEX MIGRATION PORTION
60
61
COORDINATE CALCULATION PORTION
IMAGE DEFORMATION PORTION
COORDINATE TRANS-FORMATION TABLE STORAGE PORTION
62
63
22
TRANSPARENCY NORMALIZATION PORTION
NORMALIZED TRANSPARENCY LAYER IMAGE (FIRST IMAGE)
21
TRANSPARENCY LAYER IMAGE GENERATION PORTION
20
FIRST IMAGE GENERATION PORTION
NORMALIZED TRANSPARENCY LAYER IMAGE STORAGE PORTION
23
MAKEUP ELEMENT IMAGE DEFORMATION PORTION
COLOR LAYER GENERATION PORTION
31
COLOR CONVERSION PROCESSING PORTION
32
COLOR CONVERTED LAYER IMAGE (SECOND IMAGE)
70
SYNTHESIS PORTION
USE-REFERENCE IMAGE STORAGE PORTION
14
REFERENCE IMAGE STORAGE PORTION
11
COLOR CONVERTED LAYER IMAGE STORAGE PORTION
33
80
DISPLAY PORTION
REFERENCE IMAGE ACQUISITION PORTION
INITIAL SETTING PORTION
13
MANIPULATION PORTION
12
10
30
SECOND IMAGE GENERATION PORTION
FRAME IMAGE

FIG.3

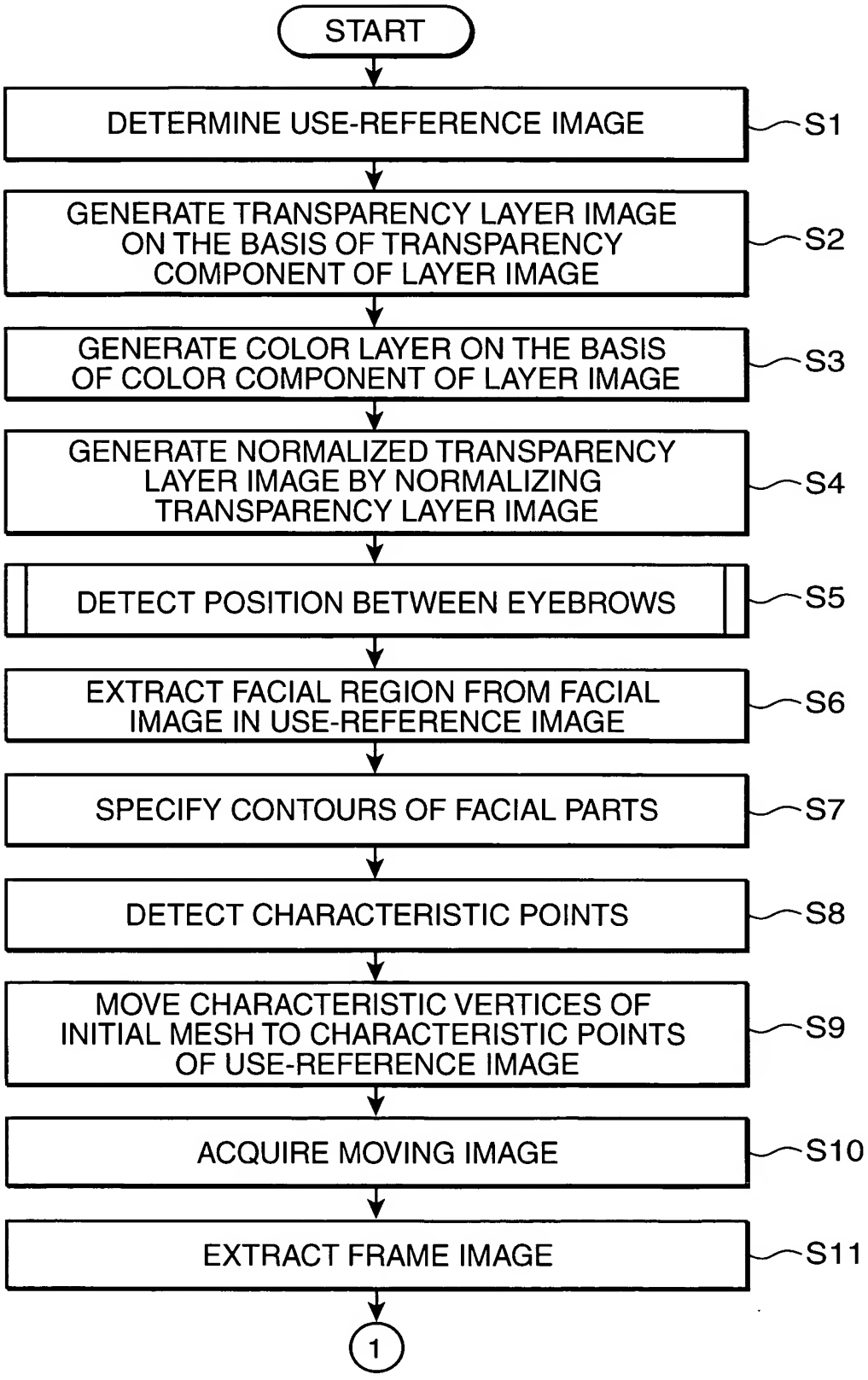

START
DETERMINE USE-REFERENCE IMAGE
S1
GENERATE TRANSPARENCY LAYER IMAGE ON THE BASIS OF TRANSPARENCY COMPONENT OF LAYER IMAGE
S2
GENERATE COLOR LAYER ON THE BASIS OF COLOR COMPONENT OF LAYER IMAGE
S3
GENERATE NORMALIZED TRANSPARENCY LAYER IMAGE BY NORMALIZING TRANSPARENCY LAYER IMAGE
S4
DETECT POSITION BETWEEN EYEBROWS
S5
EXTRACT FACIAL REGION FROM FACIAL IMAGE IN USE-REFERENCE IMAGE
S6
SPECIFY CONTOURS OF FACIAL PARTS
S7
DETECT CHARACTERISTIC POINTS
S8
MOVE CHARACTERISTIC VERTICES OF INITIAL MESH TO CHARACTERISTIC POINTS OF USE-REFERENCE IMAGE
S9
ACQUIRE MOVING IMAGE
S10
EXTRACT FRAME IMAGE
S11
1

FIG.4

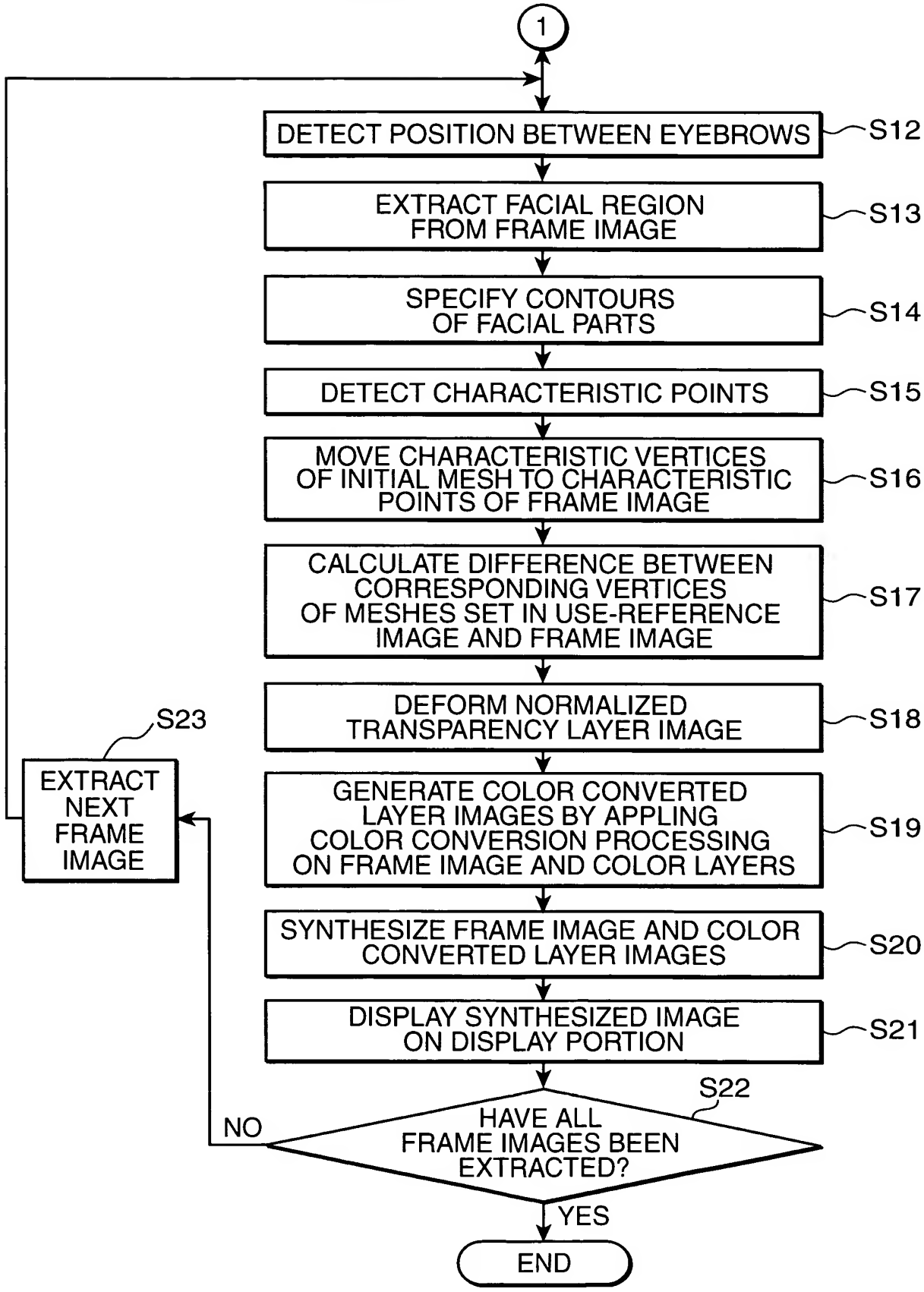
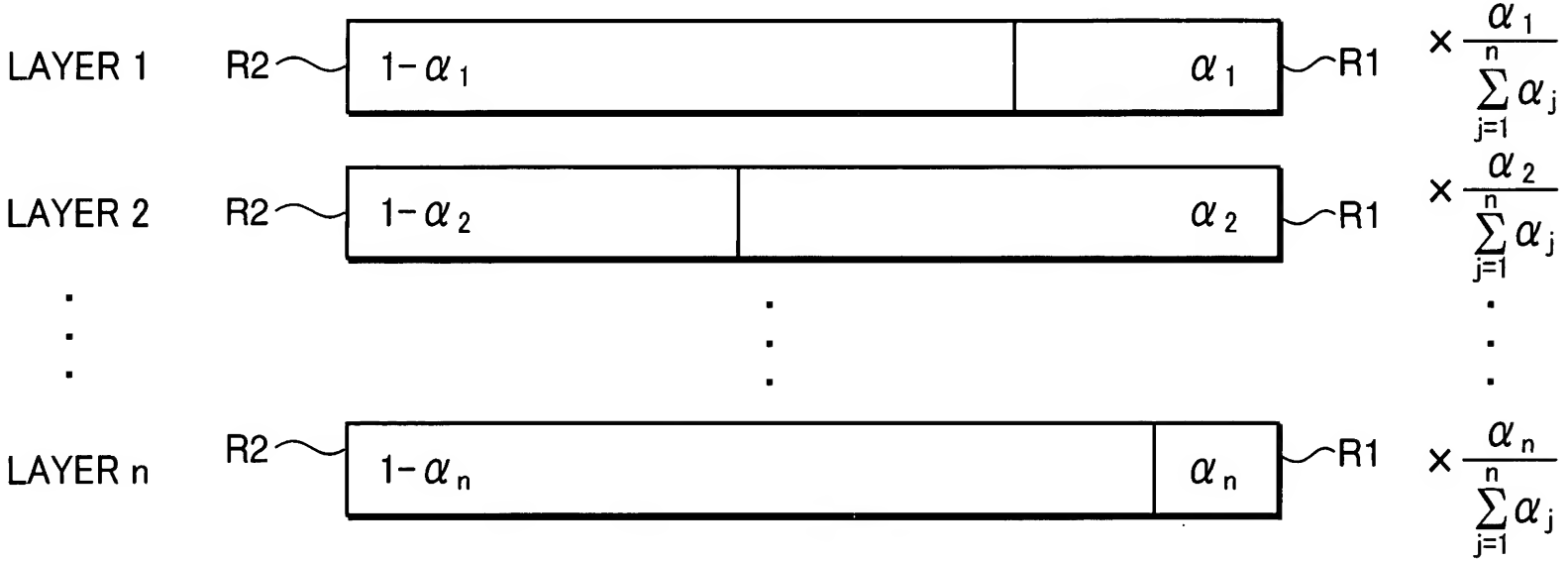

1
DETECT POSITION BETWEEN EYEBROWS
S12
EXTRACT FACIAL REGION FROM FRAME IMAGE
S13
SPECIFY CONTOURS OF FACIAL PARTS
S14
DETECT CHARACTERISTIC POINTS
S15
MOVE CHARACTERISTIC VERTICES OF INITIAL MESH TO CHARACTERISTIC POINTS OF FRAME IMAGE
S16
CALCULATE DIFFERENCE BETWEEN CORRESPONDING VERTICES OF MESHES SET IN USE-REFERENCE IMAGE AND FRAME IMAGE
S17
DEFORM NORMALIZED TRANSPARENCY LAYER IMAGE
S18
GENERATE COLOR CONVERTED LAYER IMAGES BY APPLING COLOR CONVERSION PROCESSING ON FRAME IMAGE AND COLOR LAYERS
S19
SYNTHESIZE FRAME IMAGE AND COLOR CONVERTED LAYER IMAGES
S20
DISPLAY SYNTHESIZED IMAGE ON DISPLAY PORTION
S21
S22
HAVE ALL FRAME IMAGES BEEN EXTRACTED?
NO
YES
S23
EXTRACT NEXT FRAME IMAGE
END

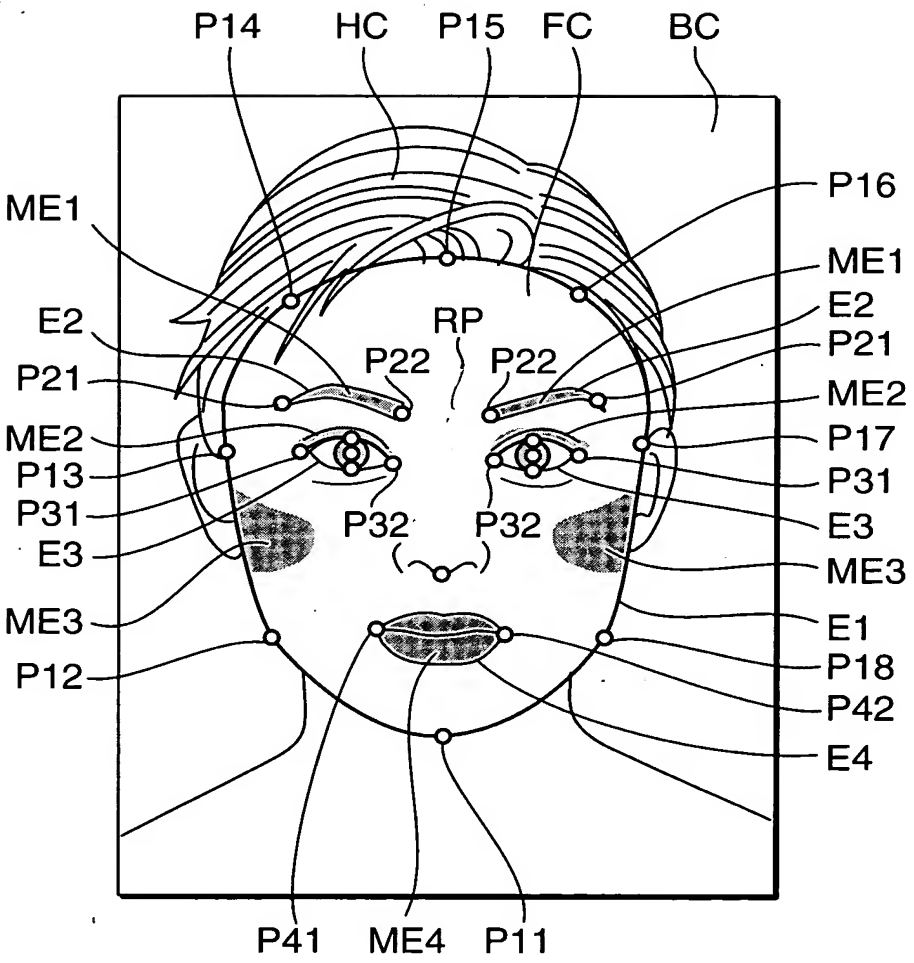
FIG.5



$$\gamma = \frac{\sum_{i=1}^{n} \alpha_i (1-\alpha_i)}{\sum_{j=1}^{n} \alpha_j} \cdots \text{EQUATION (2)}$$

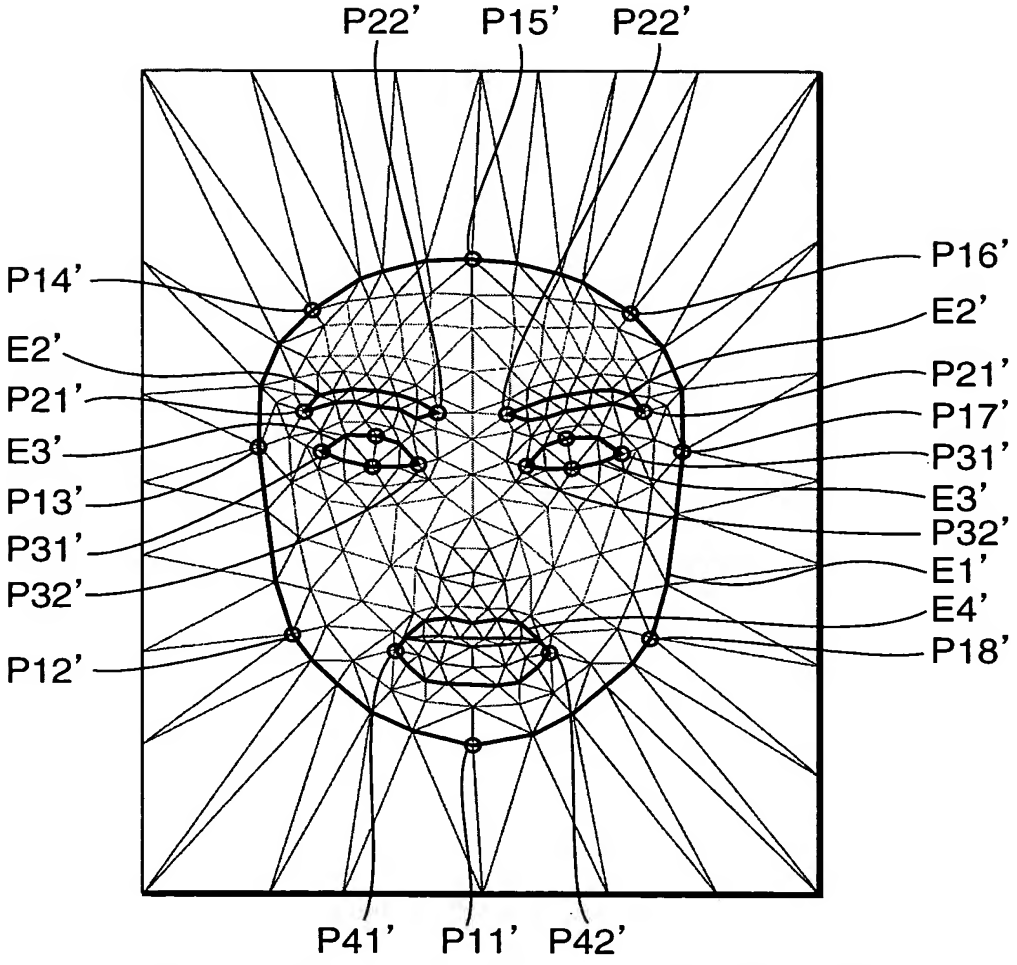
$$\beta_i = \frac{\alpha_i^2}{\sum_{j=1}^{n} \alpha_j} \cdots \text{EQUATION (1)}$$

FIG.6

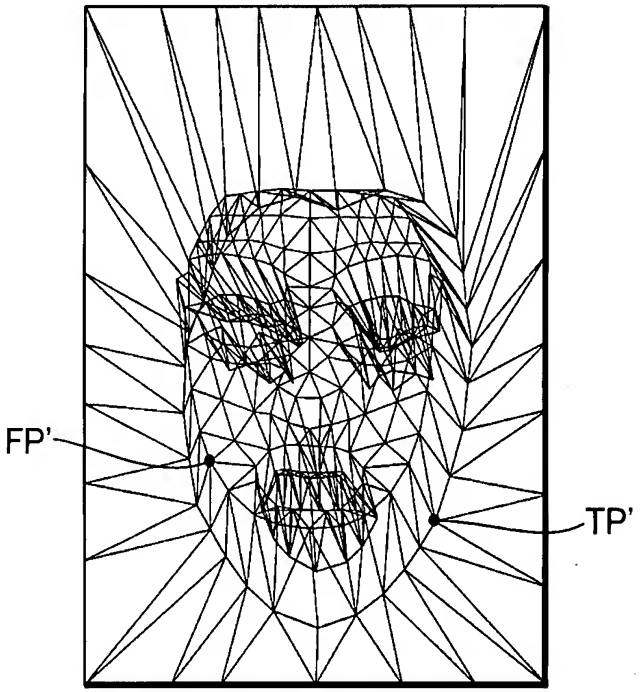


TP(P11～P18,P21,P22,P31,P32,P41,P42)

FIG.7



TP'(P11'～P18',P21',P22',P31',P32',P41',P42')



0 TIMES

FIG.8A

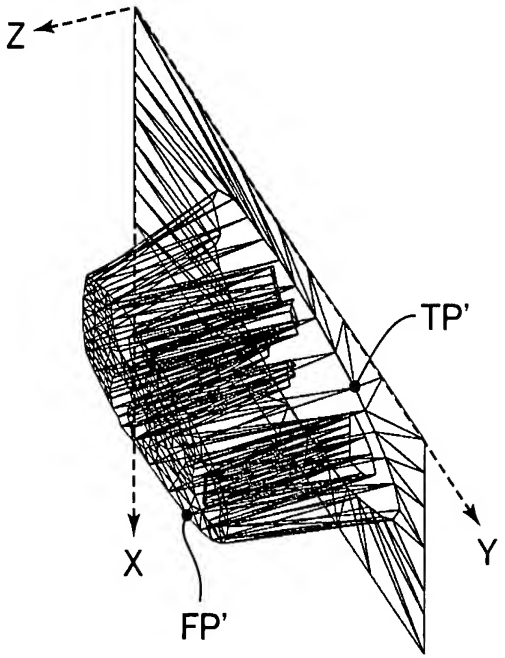
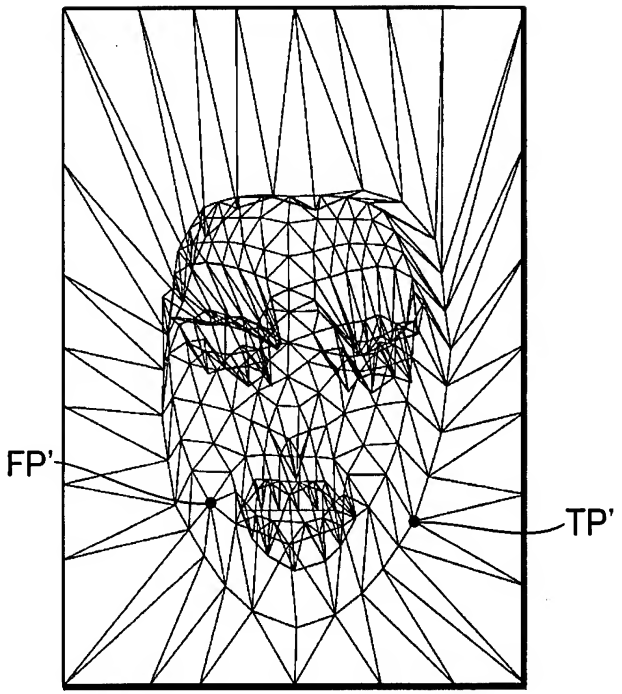


FIG.8B



1 TIMES

FIG.9A

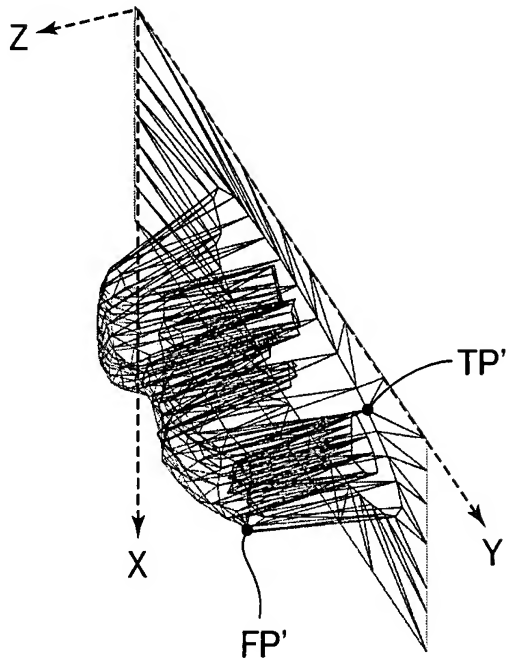
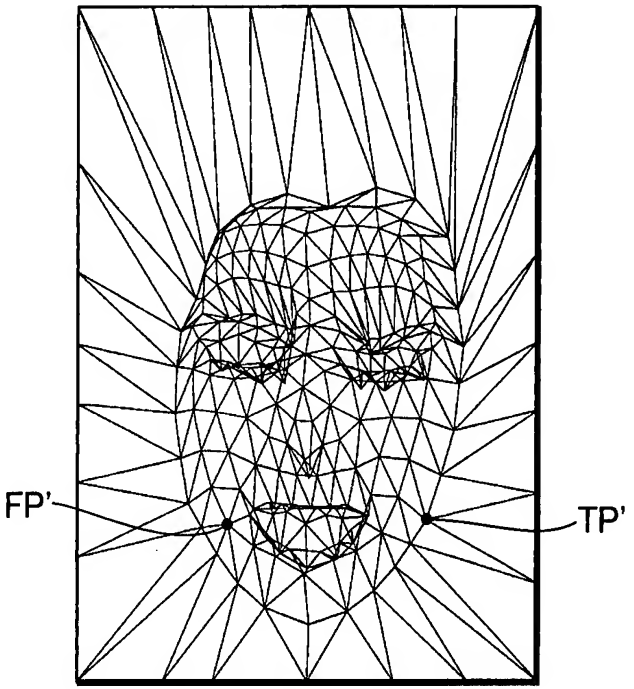


FIG.9B



5 TIMES

FIG.10A

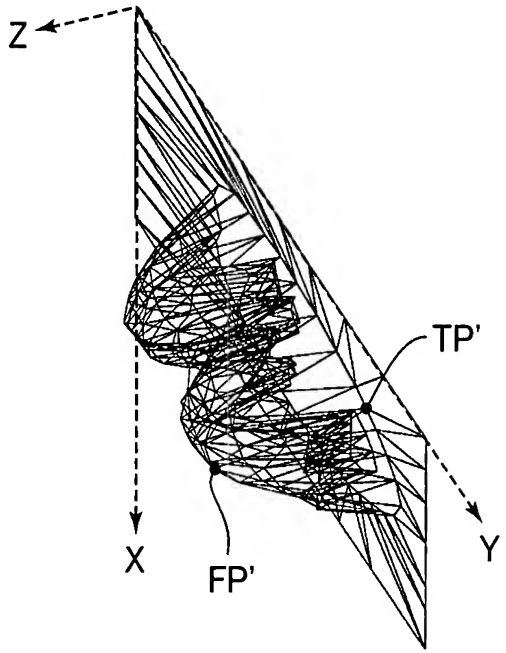
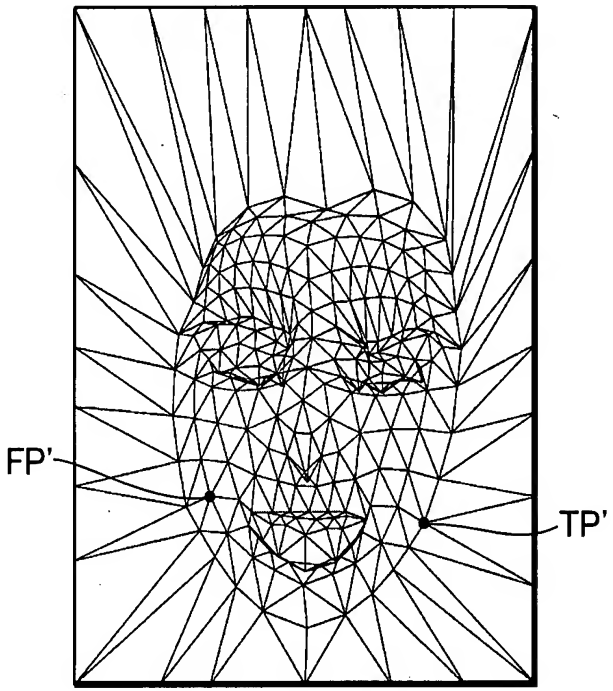


FIG.10B



10 TIMES

FIG.11A

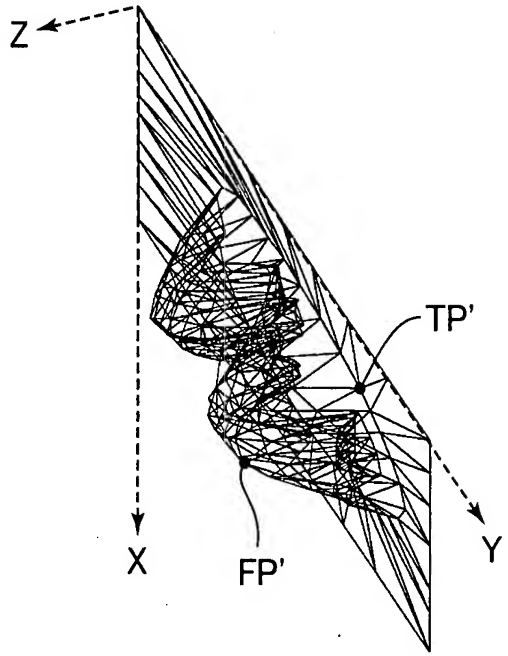
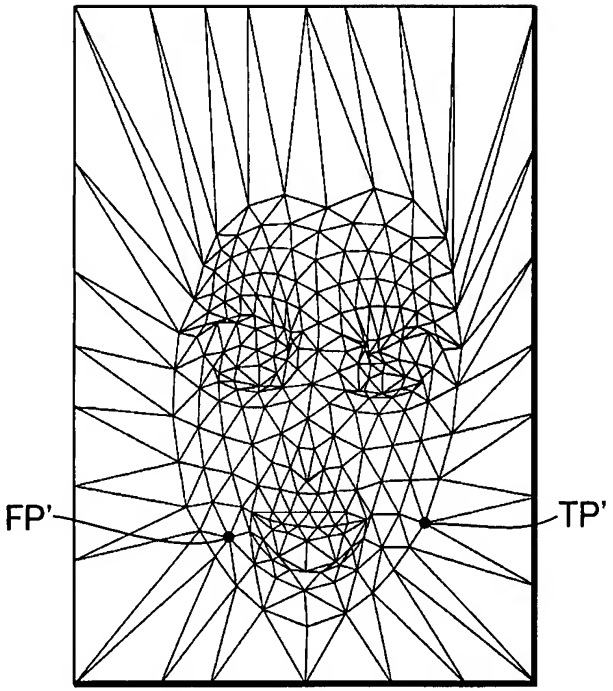


FIG.11B



20 TIMES

FIG.12A

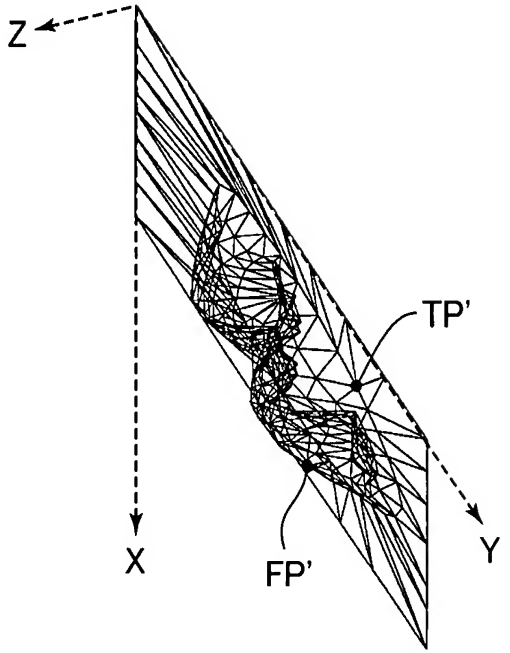
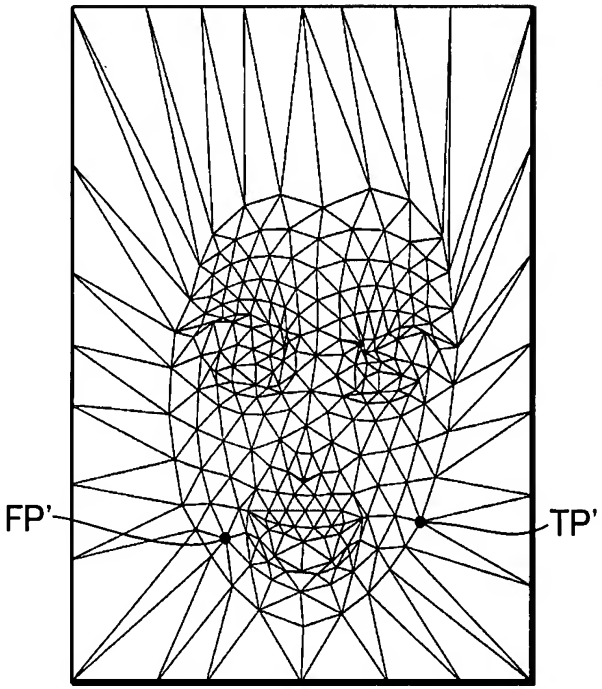


FIG.12B



30 TIMES

FIG.13A

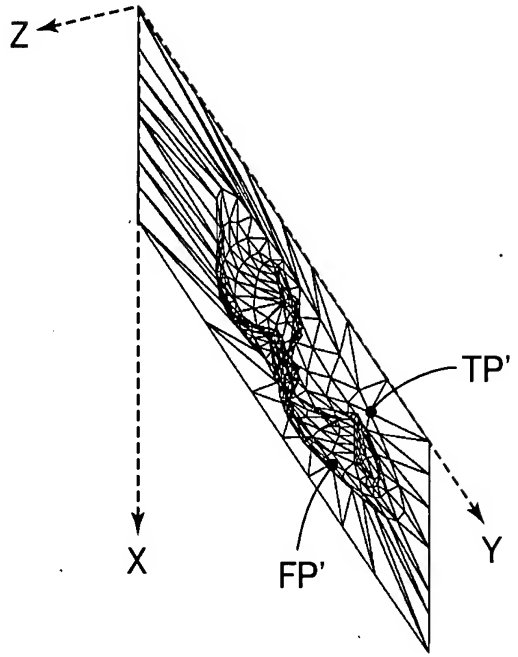
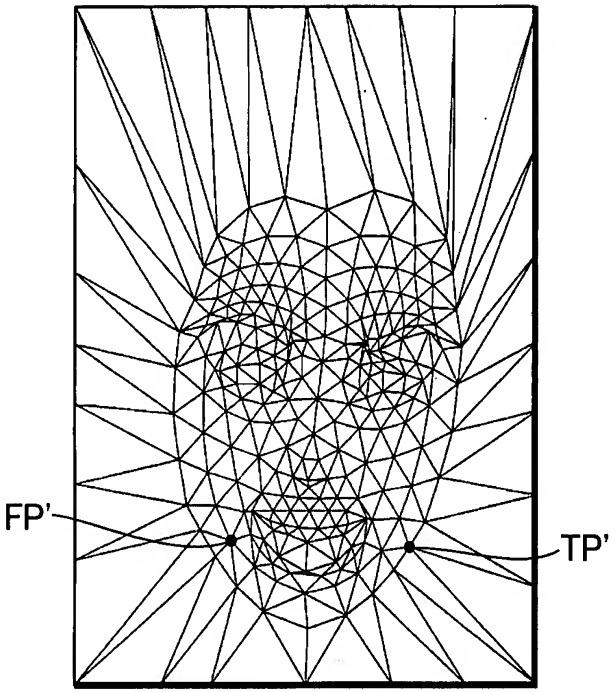


FIG.13B



60 TIMES

FIG.14A

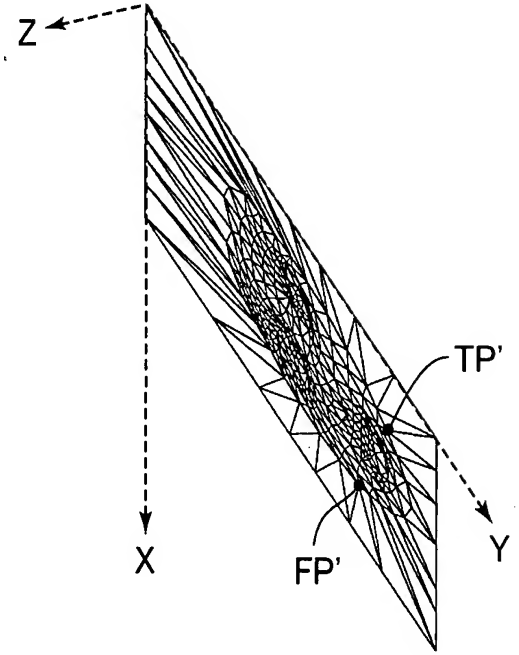


FIG.14B

FIG.15

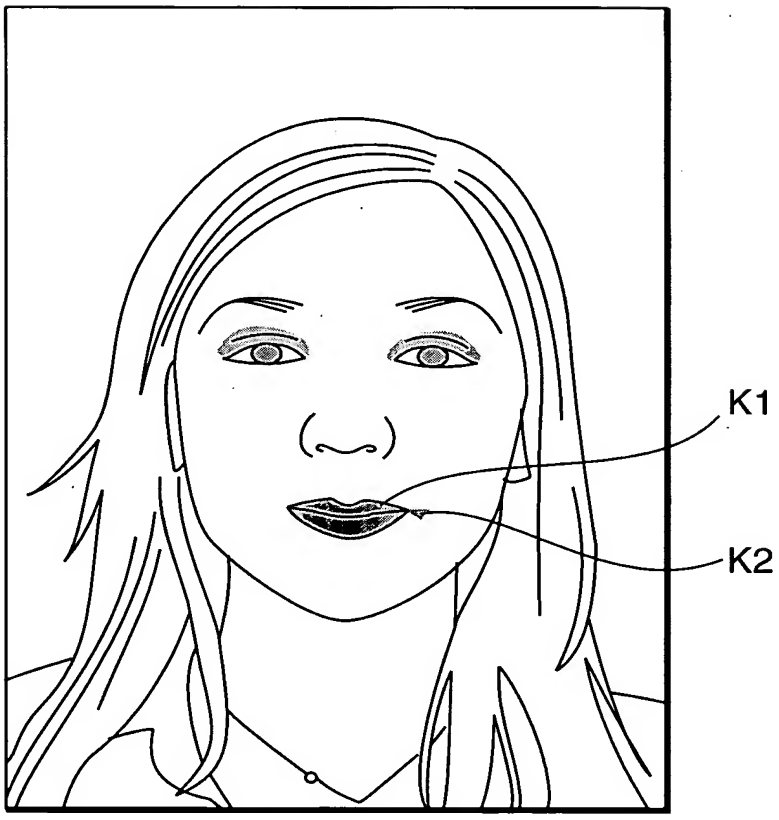


FIG.16

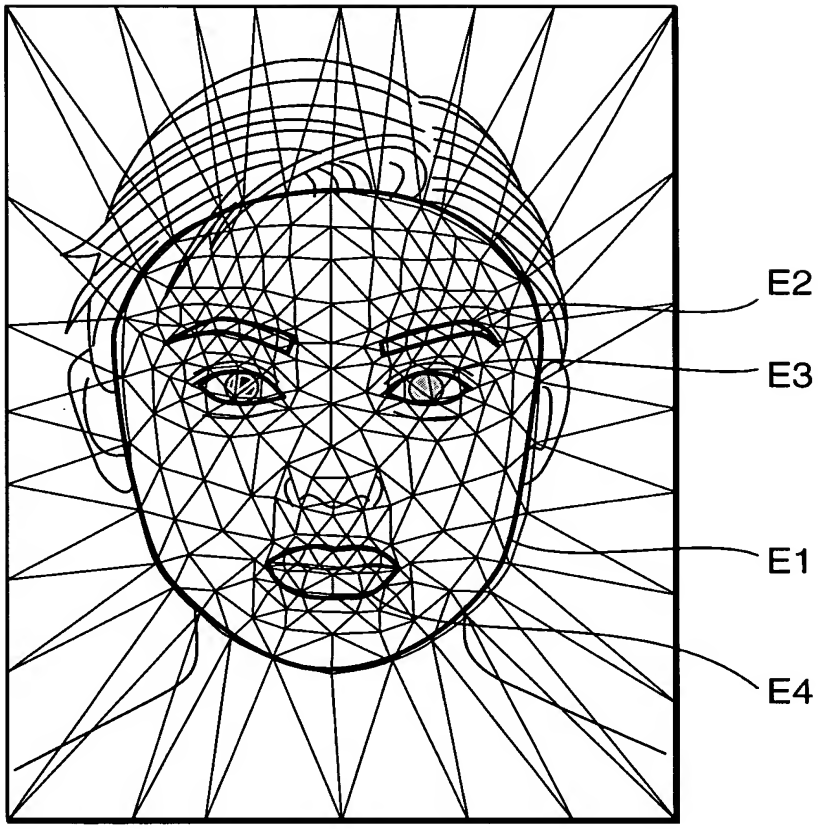
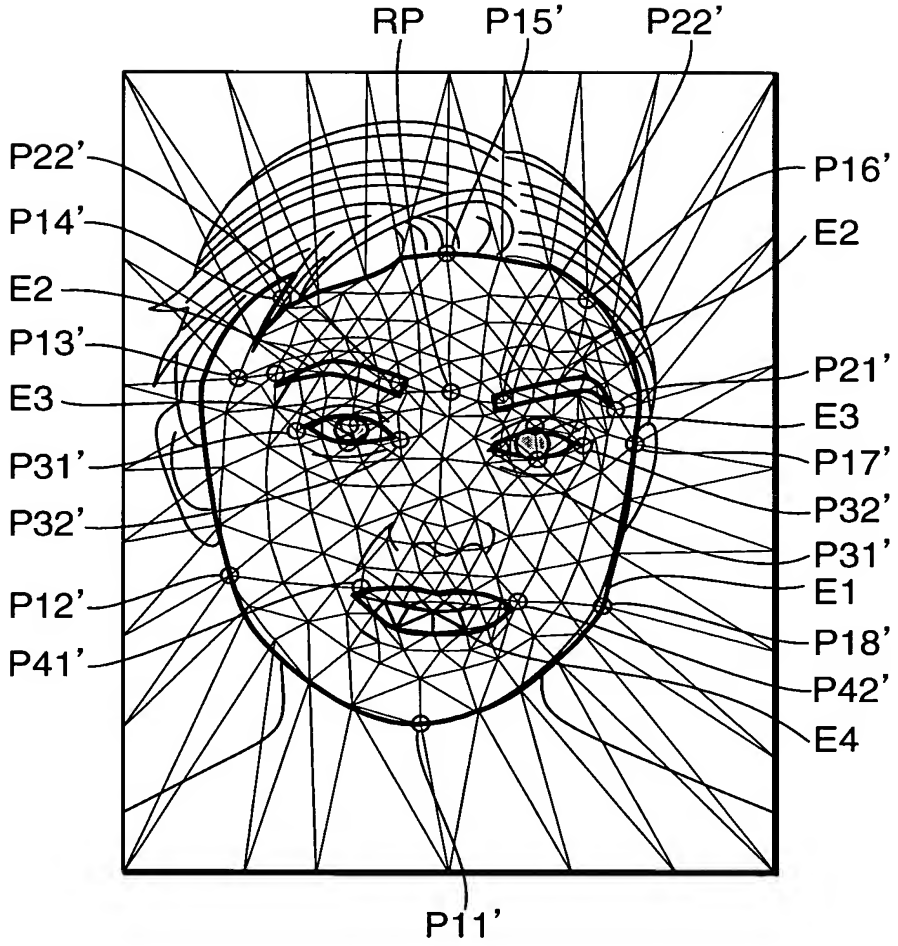


FIG.17


RP
P15'
P22'
P22'
P14'
E2
P13'
E3
P31'
P32'
P12'
P41'
P11'
P16'
E2
P21'
E3
P17'
P32'
P31'
E1
P18'
P42'
E4

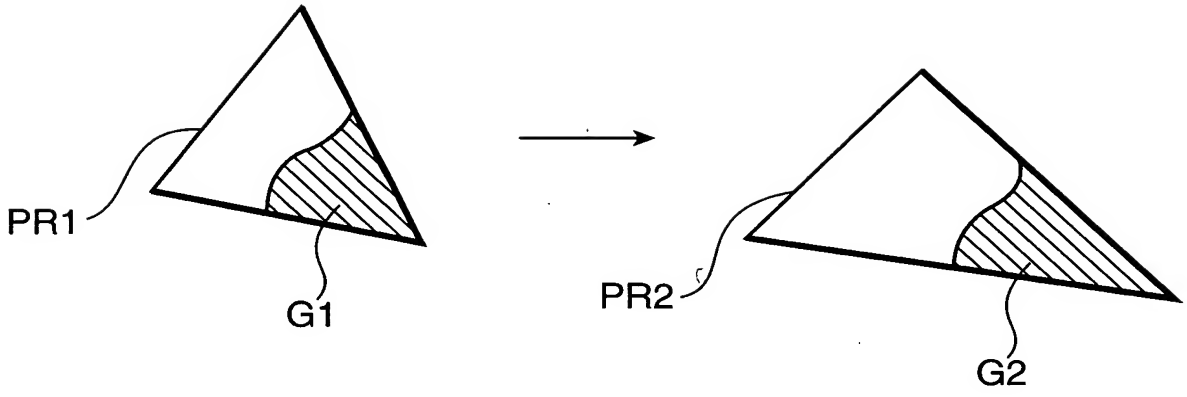


FIG.18A

FIG.18B

FIG.19

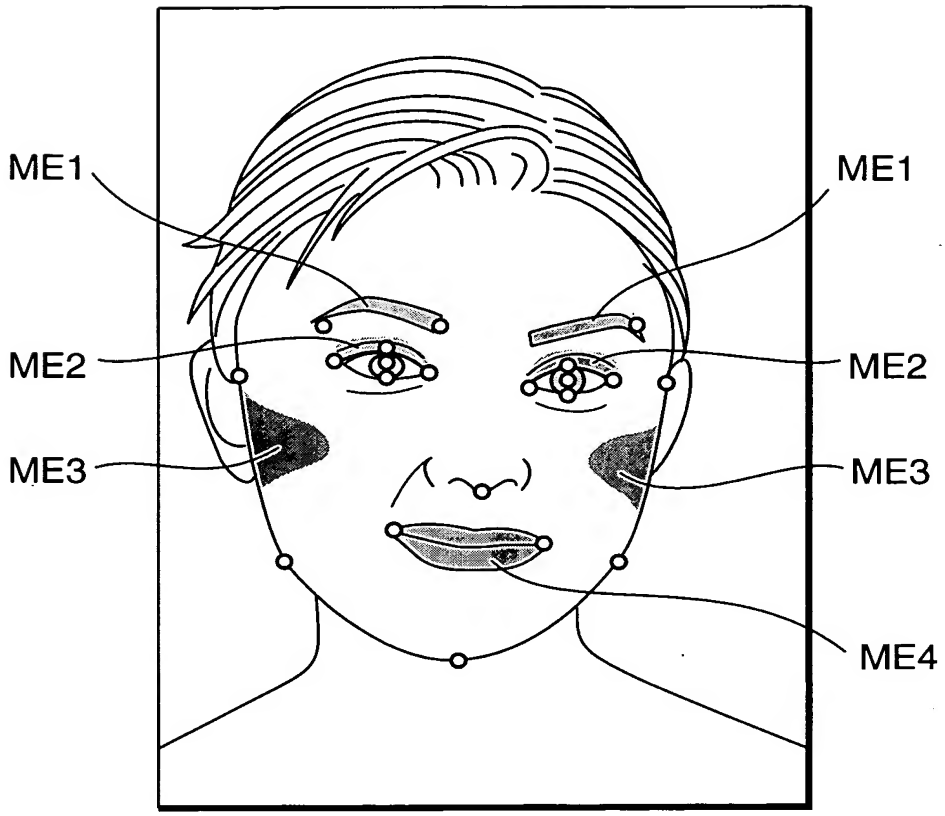


FIG.20

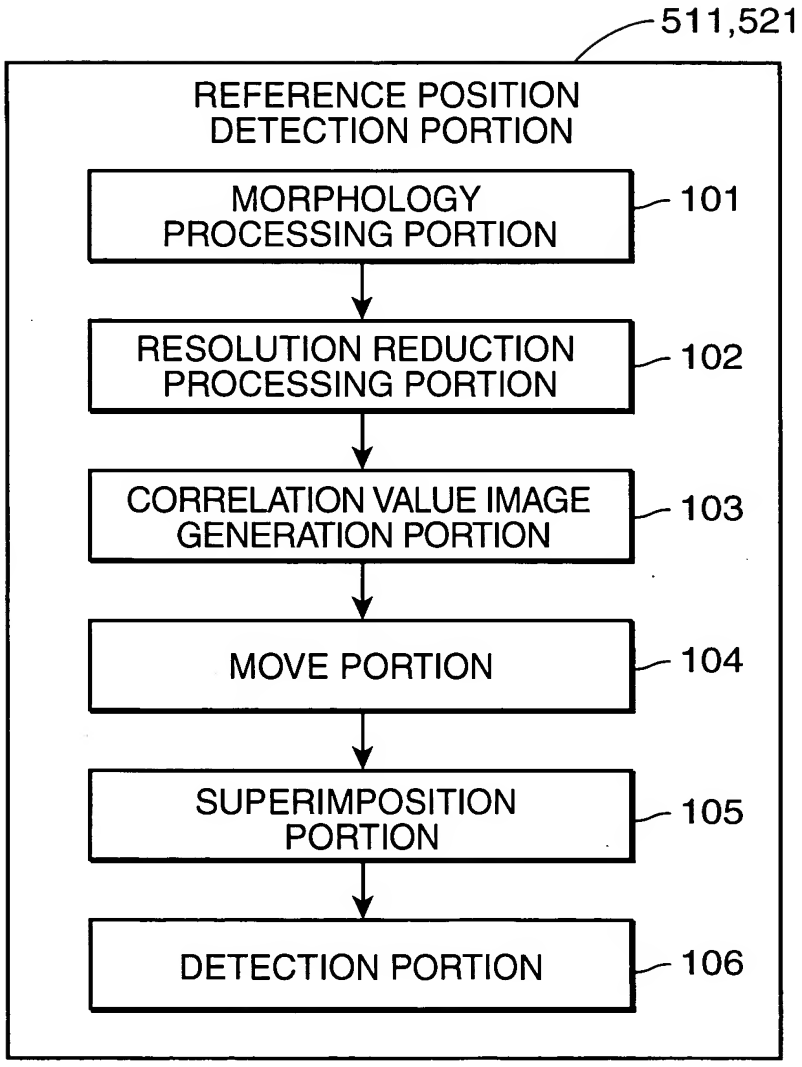

511,521
REFERENCE POSITION DETECTION PORTION
MORPHOLOGY PROCESSING PORTION
101
RESOLUTION REDUCTION PROCESSING PORTION
102
CORRELATION VALUE IMAGE GENERATION PORTION
103
MOVE PORTION
104
SUPERIMPOSITION PORTION
105
DETECTION PORTION
106

FIG.21

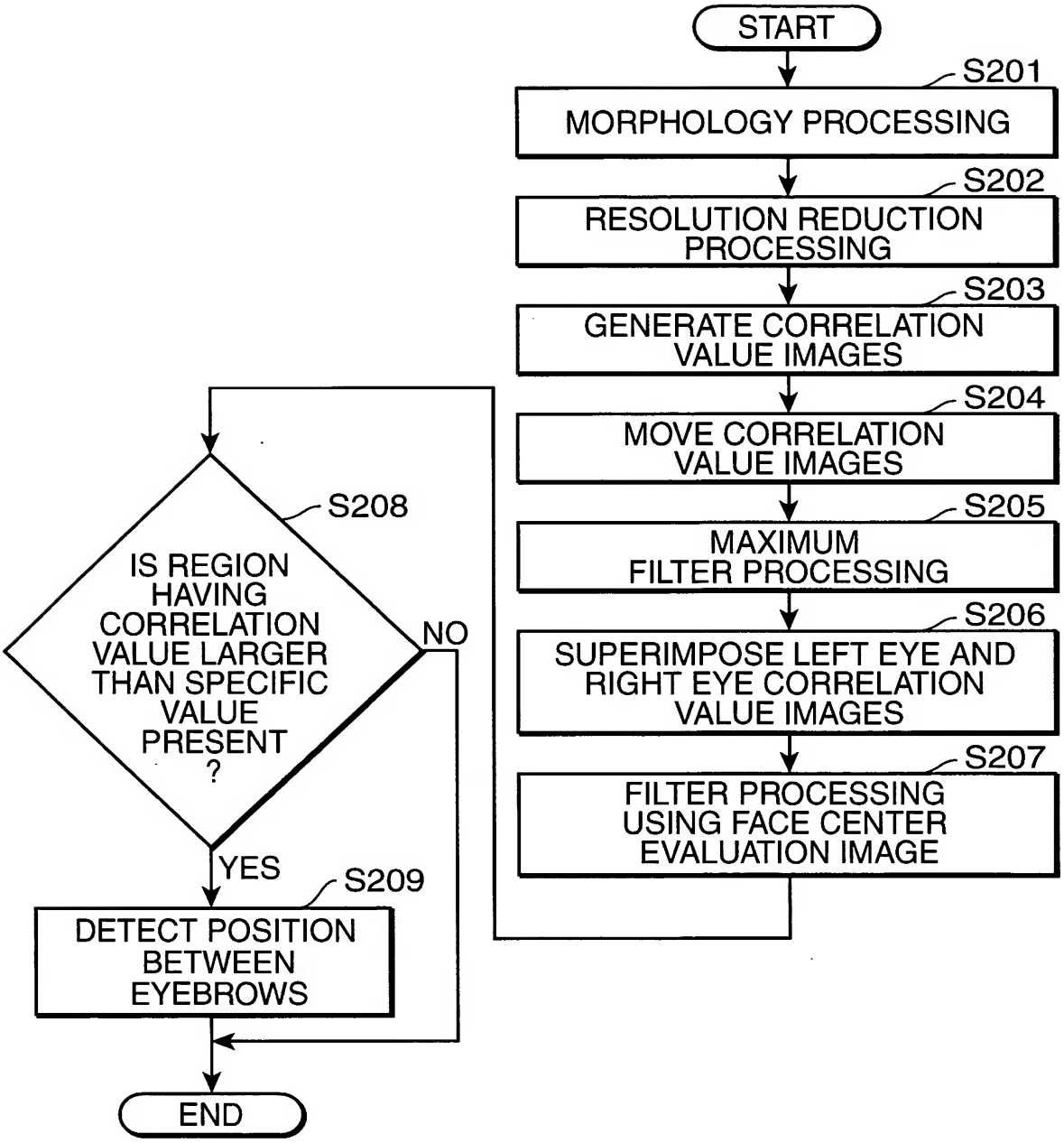

START
S201
MORPHOLOGY PROCESSING
S202
RESOLUTION REDUCTION PROCESSING
S203
GENERATE CORRELATION VALUE IMAGES
S204
MOVE CORRELATION VALUE IMAGES
S205
MAXIMUM FILTER PROCESSING
S206
SUPERIMPOSE LEFT EYE AND RIGHT EYE CORRELATION VALUE IMAGES
S207
FILTER PROCESSING USING FACE CENTER EVALUATION IMAGE
S208
IS REGION HAVING CORRELATION VALUE LARGER THAN SPECIFIC VALUE PRESENT ?
NO
YES
S209
DETECT POSITION BETWEEN EYEBROWS
END

FIG.22

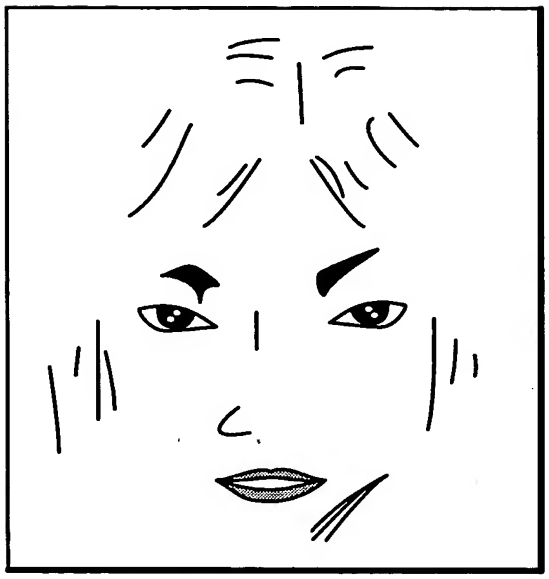


FIG.23A

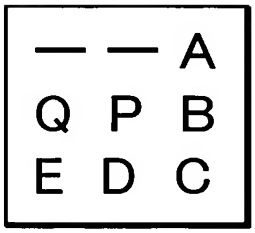


FIG.23B

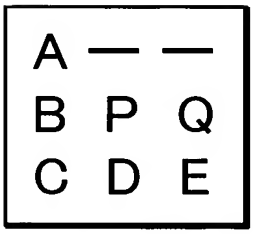


FIG.24A

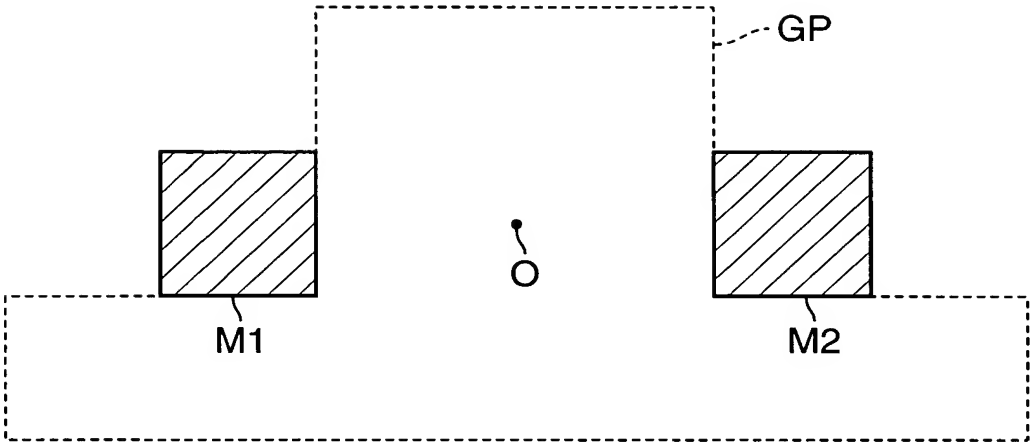
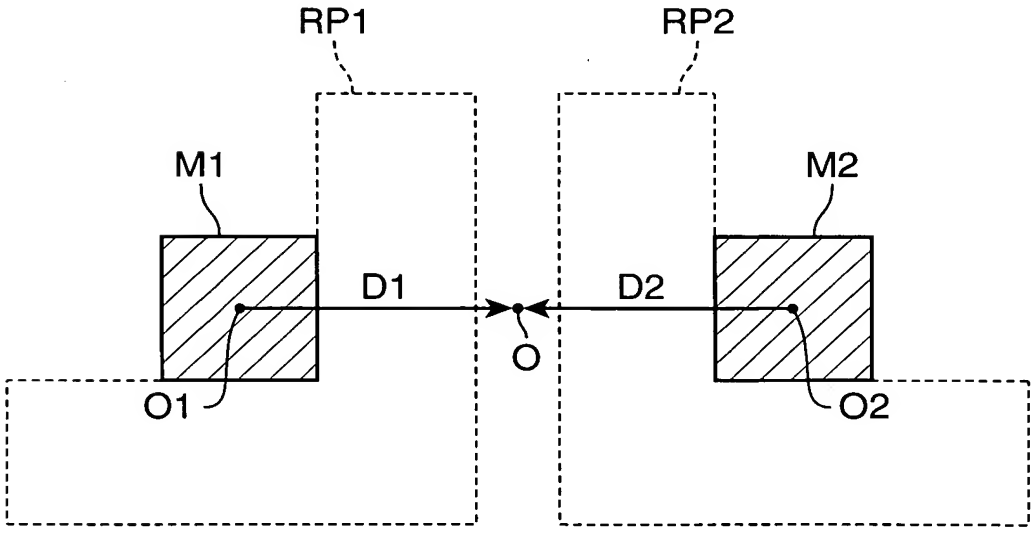


FIG.24B



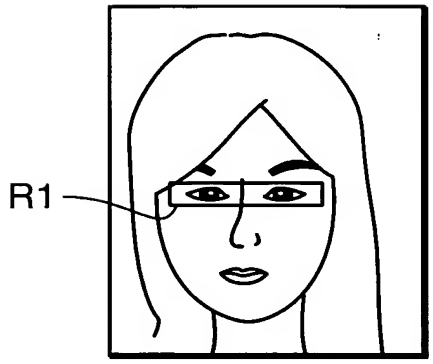


FIG.25A

FIG.25B

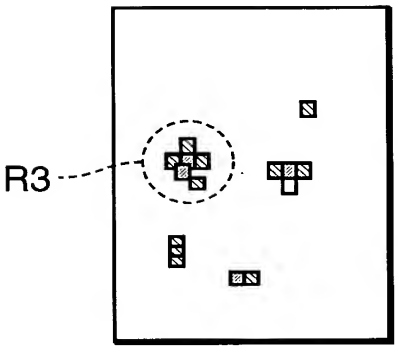


FIG.26A

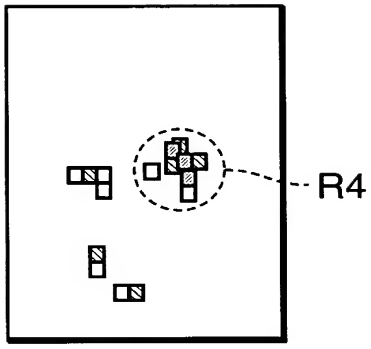


FIG.26B

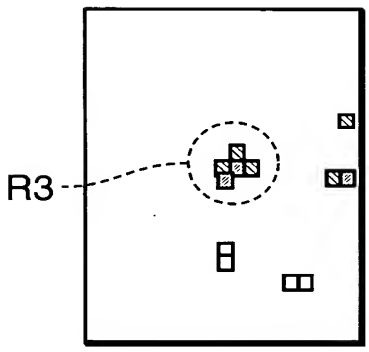


FIG.27A

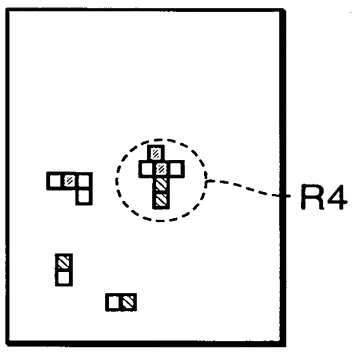


FIG.27B

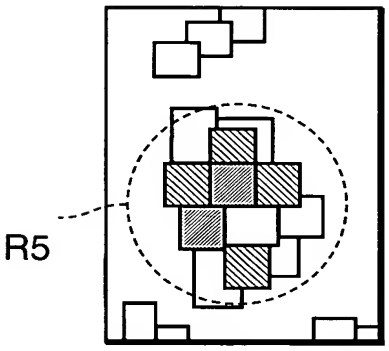


FIG.28A

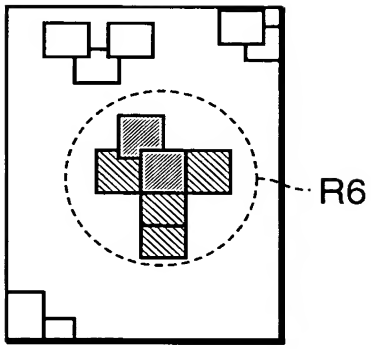


FIG.28B

FIG.29

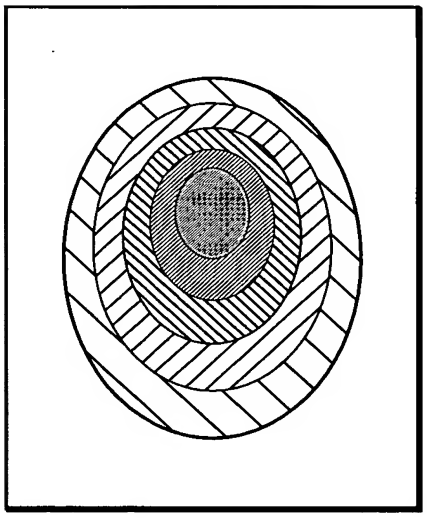


FIG.30

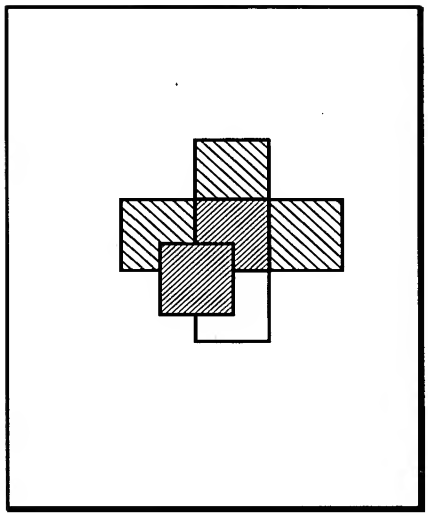


FIG.31

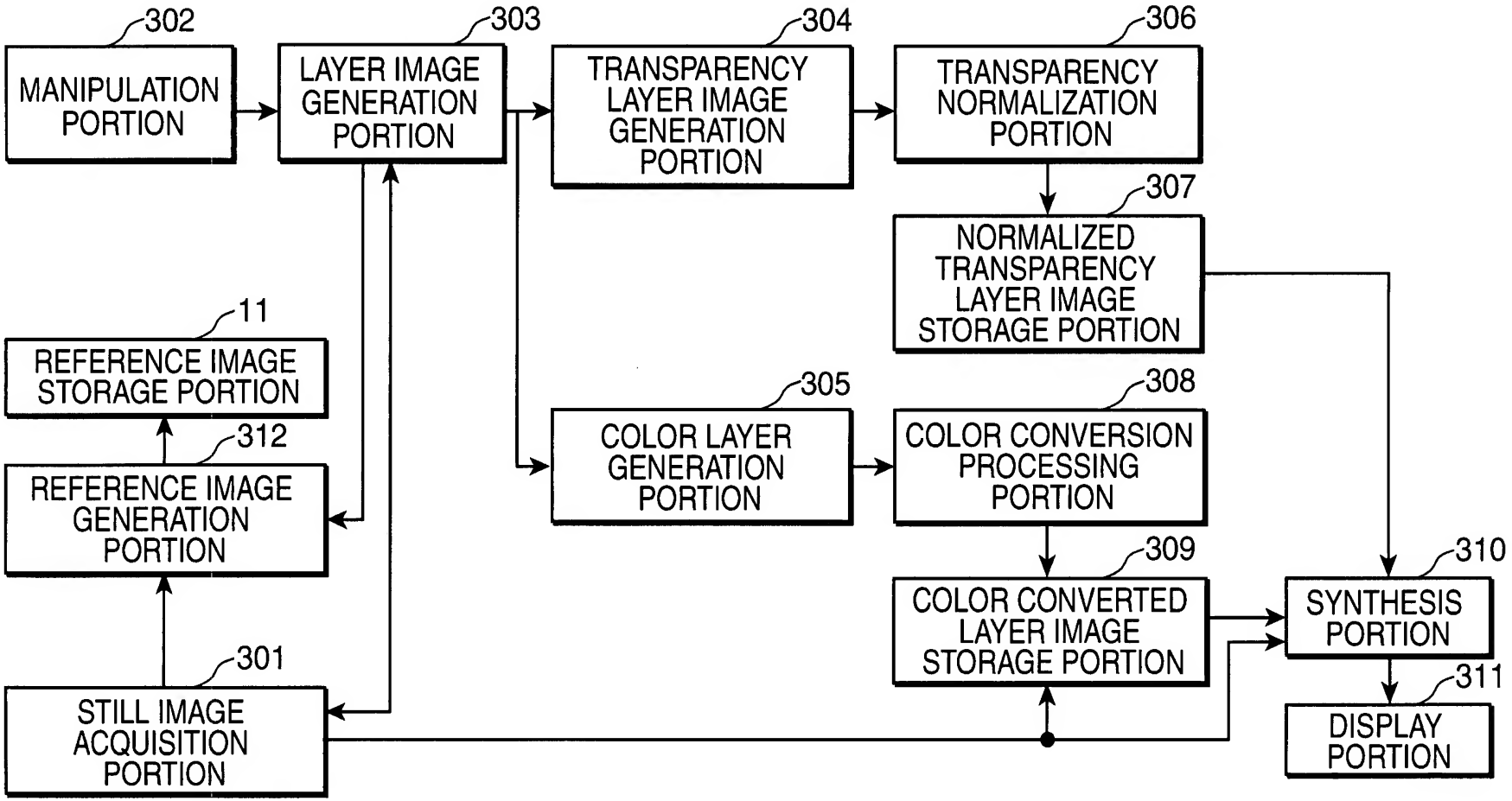
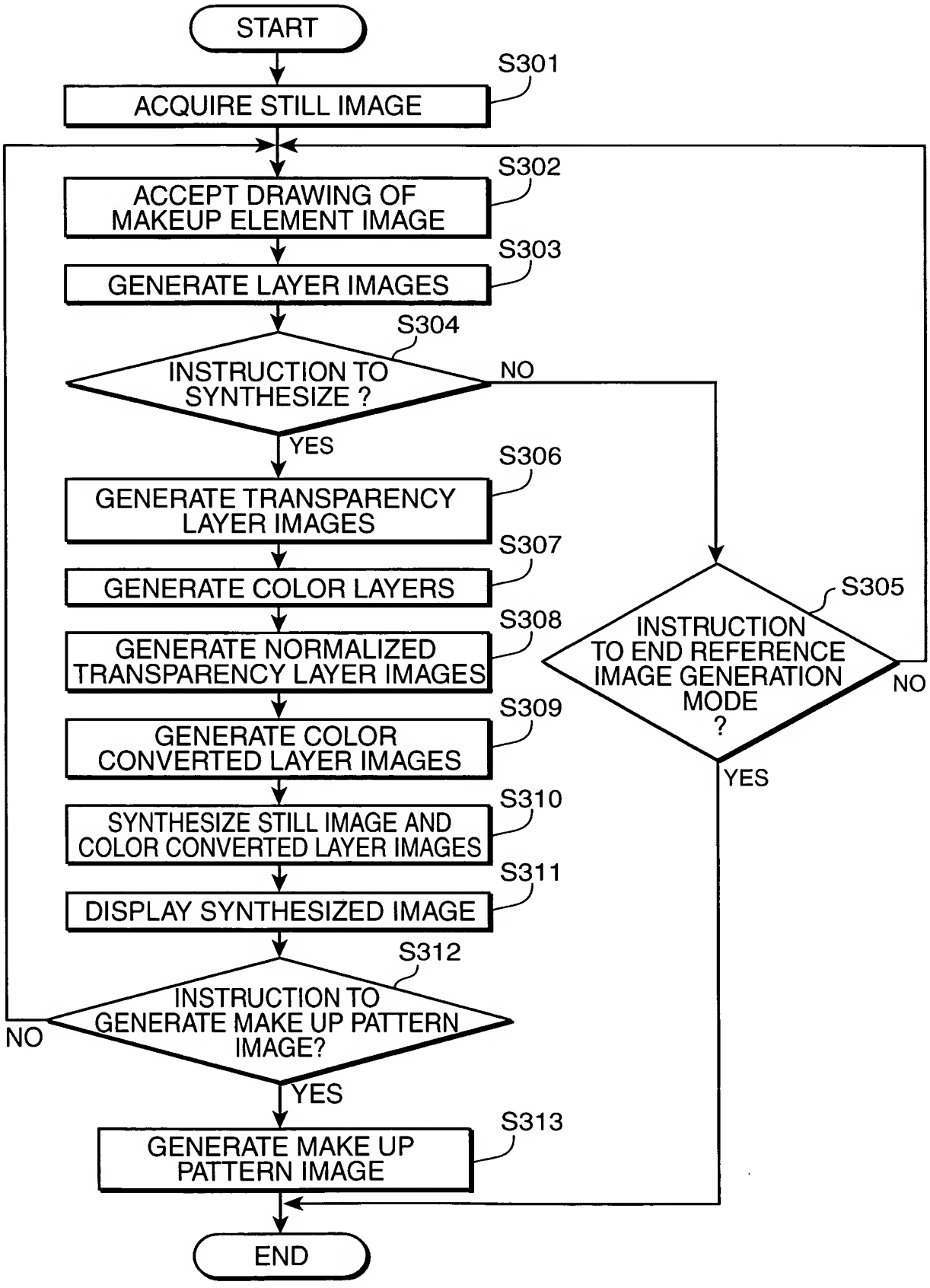

302
MANIPULATION PORTION
303
LAYER IMAGE GENERATION PORTION
304
TRANSPARENCY LAYER IMAGE GENERATION PORTION
306
TRANSPARENCY NORMALIZATION PORTION
307
NORMALIZED TRANSPARENCY LAYER IMAGE STORAGE PORTION
11
REFERENCE IMAGE STORAGE PORTION
312
REFERENCE IMAGE GENERATION PORTION
305
COLOR LAYER GENERATION PORTION
308
COLOR CONVERSION PROCESSING PORTION
309
COLOR CONVERTED LAYER IMAGE STORAGE PORTION
310
SYNTHESIS PORTION
311
DISPLAY PORTION
301
STILL IMAGE ACQUISITION PORTION

FIG.32


START
S301
ACQUIRE STILL IMAGE
S302
ACCEPT DRAWING OF MAKEUP ELEMENT IMAGE
S303
GENERATE LAYER IMAGES
S304
INSTRUCTION TO SYNTHESIZE ?
NO
YES
S306
GENERATE TRANSPARENCY LAYER IMAGES
S307
GENERATE COLOR LAYERS
S308
GENERATE NORMALIZED TRANSPARENCY LAYER IMAGES
S309
GENERATE COLOR CONVERTED LAYER IMAGES
S310
SYNTHESIZE STILL IMAGE AND COLOR CONVERTED LAYER IMAGES
S311
DISPLAY SYNTHESIZED IMAGE
S312
INSTRUCTION TO GENERATE MAKE UP PATTERN IMAGE?
NO
YES
S313
GENERATE MAKE UP PATTERN IMAGE
S305
INSTRUCTION TO END REFERENCE IMAGE GENERATION MODE ?
NO
YES
END